

ABSTRACT

According to one exemplary embodiment, a method for forming a field-effect transistor on a substrate, where the substrate includes a high-k dielectric layer situated over the substrate and a gate electrode layer situated over the high-k dielectric layer, comprises a step of etching the gate electrode layer and the high-k dielectric layer to form a gate stack, where the gate stack comprises a high-k dielectric segment situated over the substrate and a gate electrode segment situated over the high-k dielectric segment. According to this exemplary embodiment, the method further comprises performing a nitridation process on the gate stack. The nitridation process can be performed by, for example, utilizing a plasma to nitridate sidewalls of the gate stack, where the plasma comprises nitrogen. The nitridation process can cause nitrogen to enter the high-k dielectric segment and form an oxygen diffusion barrier in the high-k dielectric segment, for example.

Figure 2 should accompany the Abstract.